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USACE / NAVFAC / AFCESA | **UFGS-L-15992N (February 2003)**

Preparing Activity: LANTNAVFACENGCOM | **Superseding UFGS-L-15992N (March 2001)**

UNIFIED FACILITIES GUIDE SPECIFICATIONS

Use for LANTNAVFACENGCOM projects only
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02/03

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SECTION 15992N

INSPECTION, TESTING, AND CERTIFICATION OF UNFIRED PRESSURE VESSELS

02/03

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NOTE: This guide specification covers requirements for Contractor furnished inspection testing, and certification (ITC) of unfired pressure vessels (UPV).

Include this specification section in projects that provide or lease unfired pressure vessels for the Naval Shore Establishment, including portable unfired pressure vessels, liquid propane gas (LPG) storage tanks. Gas storage flasks, volume tanks, fire water tanks, and filter with a internal cross sectional dimension in excess of 3 inches75 mm also require ITC in compliance with this specification section.

However, application of this specification is limited by vessel pressure and volume as follows:

a. Any UPV with a internal or external working pressure of less than 15 psig103 kPa guage shall not require ITC.

b. Any UPV, with a working pressure of 15 psig to 249 psig103 kPa to 1709 kpa (guage), but a volume of less than 5 cubic feet0.1416 cubic meters shall not require ITC.

c. Any UPV with a working pressure of 250 psig to 599 psig1710 kPa to 4130 kPa (gauge), but a volume of less than 1.5 cubic feet0.04248 cubic meters, shall not require ITC.

The following equipment is not covered by this specification:

a. Cylinders including DOT flasks, for shipment of compressed or liquefied gases, (DLA Regulation No. 4145.25, Storage and Handling of Compressed gases and Liquids in Cylinders, and Cylinders governs.)

b. Air tanks for air brakes on vehicles.

c. Unfired pressure vessels containing only water

under pressure at ambient temperature for domestic or industrial process supply purposes. Those containing air, the compression of which serves only as a cushion, must be inspected if pressures exceed those specified above.

d. Unfired pressure vessels used as refrigerant receivers for refrigerating and air conditioning equipment.

e. Fire extinguishers.

f. Shore-based hyperbaric facility pressure vessels used for manned operation of for testing animal or equipment.

NOTE: Suggestions for improvement of this specification will be welcomed using the Navy "Change Request Forms" subdirectory located in SPECSINTACT in Jobs or Masters under "Forms/Documents" directory or DD Form 1426. Suggestions should be forwarded to:

Commander
Naval Facilities Engineering Command
Engineering Innovation and Criteria Office, Code EICO
1510 Gilbert Street
Norfolk, VA 23511-2699

Email: LantDiv@efdlant.navfac.navy.mil

Use of electronic communication is encouraged.

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PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

National Board of Boiler and Pressure Vessel Inspection (NBBI)

NBBI NB-23	(1998) National Board Inspection Code (NBIC)

1.2 SYSTEM DESCRIPTION

The work includes inspecting, testing, and certification of unfired pressure vessels (UPV) in accordance with NBBI NB-23 prior to acceptance by the Contracting Officer.

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NOTE: Where a "G" in submittal tags follows a submittal item, it indicates Government approval for that item. Add "G" in submittal tags following any added or existing submittal items deemed

sufficiently critical, complex, or aesthetically significant to merit approval by the Government. Submittal items not designated with a "G" will be approved by the QC organization.

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1.3 SUBMITTALS

Submit to the NAVFACENGCOM boiler inspector licensing authority by way of the Resident Officer In Charge of Construction in accordance with Section 01330, "Submittal Procedures".

SD-06, Test Reports

Data Record Sheet for UPV; G (NAVFAC FORM 9-11014/40)

Inspection Report for UPV; G (NAVFAC FORM 9-11014/41)

Inspection Certificate for UPV; G (NAVFAC FORM 9-11014/32)

SD-07 Certificates

Qualifications of boiler inspector; G

Boiler inspector's registration number from the National Board of Boiler and Pressure Vessel Inspectors (NBBI NB-23). G

Step by step procedures the boiler inspector will use to inspect, test, and certify the UPV.; G

Inspection reports and certificates.; G

1.4 DEFINITIONS

1.4.1 Certificate of Competency

Boiler inspector shall have education and experience as follows:

a. From an accredited school, a degree in mechanical engineering plus one year of experience in design, construction, operation or inspection of boilers and pressure vessels. Accredited school is defined as an engineering technology (ABET).

OR

b. from an accredited school, a degree in a branch of engineering other than mechanical engineering, an associate degree in mechanical technology plus two years of experience in design, construction, operation, or inspection of boilers and pressure vessels.

OR

c. a high school education or equivalent plus three years of experience in one of the following categories.

1. In boiler and pressure vessel construction or repair.

2. In charge of boiler and pressure vessel operation.

3. In the inspection of boilers and pressure vessels.

1.5 QUALIFICATIONS OF BOILER INSPECTOR

The boiler inspector shall have a Certificate of Competency, and a NBBI NB-23 Commission. If the boiler inspector's Certificate of Competency and NBBI NB-23 Commission are acceptable to the Boiler Inspector's Licensing Board, the boiler inspector will be licensed by the Boiler Inspector Licensing Board of LANTNAVFACENGCOM. Boiler inspector's registration number from the National Board of Boiler and Pressure Vessel Inspectors shall be on all certificates.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 GENERAL INSPECTION REQUIREMENTS

The Contractor shall be responsible for the performance of all tests and inspections as specified in this Section. All labor, equipment, and test apparatus required to accomplish the specified inspections and testing work shall be furnished by the Contractor. The Government will furnish electricity for the tests.

3.2 FIELD INSPECTIONS AND TESTING

Provide the following inspection and testing on each UPV in accordance with the requirements specified in the National Board Inspection Code (NBBI NB-23) and the additional requirements specified in this Section. The inspection and testing shall be conducted by a boiler inspector who meets the certification requirements specified in Part 1 of this Section. All tests and inspections at the site shall be made under the direction of and be subject to the approval of the Contracting Officer. Control of noise levels shall be conducted in such a manner as not to create a nuisance or hazard and shall be subject to the approval of the Contracting Officer. Boiler inspector shall submit step by step procedures the inspector will use to inspect, test, and certify the UPV. The tests shall include the following and shall be performed in sequence as listed:

a. General UPV Site Inspections

b. External Inspection

c. Internal Inspection

d. Hydrostatic Tests (Strength Test and Tightness Test)

e. Operation Tests

3.2.1 Hydrostatic Tests

Subject each UPV to hydrostatic tests complying with the requirements specified in the NBBI NB-23 and the following requirements:

3.2.1.1 Strength Test Pressure

Each UPV shall be tested hydrostatically to a pressure equal to 1.5 times the maximum allowable working pressure.

3.2.1.2 Preparation For Hydrostatic Test

Subject to standard testing and the following requirements:

a. Remove or gag (clamp) all safety valves with appropriate devices sup plied by the manufacturer. All gags (testing clamps) shall be numbered and maintained centrally. The inspector shall verify that all gags have been returned and the safety valves are set and sealed for normal operation.

b. Install new gaskets and tightly close all manholes and handholes.

c. Install a calibrated test gage having the proper pressure range for the hydrostatic test at the nipple provided for this purpose. If the test gage is not readily visible to the operator who will control the pressure applied, an additional calibrated pressure indicating gage shall be provided where it will be visible to the operator throughout the duration of the test. Ensure that the test pressure will not be exceeded. Ensure that all indicating gages to be used during the test have been calibrated within five days of test.

d. Remove gages and sensors, the range of which does not equal or exceed the pressure of the proposed test, and plug the opening if cut-off valves are not provided.

e. Purge possible air pockets while the vessel is filling for a hydrostatic test.

f. Close all connections on the UPV, except the air cocks, water gages, pressure gages, and the valves of the line through which the pressure is to be applied. Completely fill the UPV, through the auxiliary feed line, with fresh water at the proper temperature until water overflows through the open vent. Close all vents, water gages valves, and valves. Care should be exercised in filling UPV to assure that UPV are not subjected to full water main pressure. Direct connection of the UPV to the water system is prohibited where a backflow preventer is not installed to prevent contamination of the potable water system.

g. A power driven or hand pump shall be provided for application of the test pressure. The test pump shall be provided by the Contractor and shall be operated and inspected to ensure that the pump is in proper working condition prior to connecting to the vessel.

3.2.1.3 Application of pressure

Apply pressure at a rate not to exceed 10 percent of the test pressure per minute. Station a person at the pump suppling pressure to the UPV to control it's operation and station another person at the gage to note the pressure and to maintain the pressure constant when the limiting pressure has been reached. A person shall have direct control of the pump furnishing the pressure. Do not exceed the test pressure.

a. Test Gages

If there is reason to believe that the test gage, or the additional gage

installed to be in view of the person controlling the test pump, is in error, check the calibration. If the gage is in error, it should be adjusted to read correctly, or a calibration curve may be made to indicate the correct pressure for the reading indicated by the gage. The gage indicator or the calibration curve shall agree with the dead weight testing machine to within one half of one percent at test pressure.

b. Pressure Parts

All pressure parts shall be found tight and free from leaks. If leakage is found in the UPV while pressure is being built up, the test shall cease until the necessary repairs have been completed to eliminate the leaks.

3.2.1.4 Hold Pressure

Upon reaching the test pressure, hold for 5 minutes. The valve in the pressure line between the test pump and the UPV should then be closed, and the pressure drop occurring within 15 minutes shall be observed to see if any significant drop in pressure indicates leakage not already found. If the pressure drops more than 10 percent during the 15 minute period, it shall be assumed that pressure parts or valves are leaking at an unacceptable rate.

3.2.1.5 Inspection

a. Under Pressure

All joints and connections shall be inspected for leaks or other defects while the vessel is under pressure. The pressure held during this inspection need not necessarily be equal to hydrostatic test pressure, but shall be not less than two-thirds of the hydrostatic test pressure. Faults should be indicated with chalk or another marking device, and a notation should be made. External pressure parts connected to the UPV. Welds and riveted joints shall be inspected carefully for leaks; valves shall also be checked for leaks. Upon completing the inspection, the pressure may be relieved.

b. Pressure Released

After the pressure has been released, observe to see if any permanent deformation has occurred. If any is found, report this occurrence to the Contracting Officer for a decision on the necessary corrective action to be taken.

3.2.1.6 Gaskets

Replace manhole and handhole gaskets after performing the hydrostatic strength test. Replacement gaskets shall be UPV manufacturer's recommended replacement parts.

3.2.2 Operational Test

The UPV shall be brought up to operating pressure and temperature. All devices provided for controlling the operation and safety of the UPV shall be inspected and caused to function under operating condition. All associated valves and piping, pressure and temperature indicating devices, metering and recording devices and all UPV auxiliaries shall be inspected under operating conditions. All controls attached to the UPV, must be in good working order. The purpose of these inspections and tests is to

discover any unsafe operation or maintenance of the UPV or its auxiliaries that may be evidenced under operating conditions. The test shall continue for at least 8 hours. All deficiencies shall be corrected at no cost to the Government.

3.2.2.1 Controls

Inspect the operation of all controls directly associated with the operation and safety of the UPV for any deficiencies that may prevent proper operation.

Sequencing; the UPV shall start, operate, and stop in strict accordance with specified operational sequence.

3.2.2.2 Piping and Piping Connections

While the UPV is operating, examine all piping for deficiencies. If any are found, determine whether they are the result of excessive strains due to expansion, contraction, or other causes. Look for undue vibration, particularly in piping connections to the UPV. Where excessive vibration is found, examine connections and parts.

3.2.2.3 Safety Valve-Capacity Test

If the relieving capacity of any safety valve for UPV is questioned, it shall be retested by an acceptable method. If inadequate relieving capacity is due to deficiencies of the valve, additional safety valve capacity shall be provided if the valve is determined to be satisfactory within the relieving range of the valve, but is inefficient for the capacity of the UPV.

3.2.3 Devices

3.2.3.1 Temperature Indicating Devices

All temperature indicating devices shall be observed for indications of excessive temperatures, particularly during and immediately following the time when high load demands are made on the UPV.

3.2.3.2 Metering and Recording Devices

While the UPV is operating under normal conditions, observe the operation of all metering and recording devices. When there is evidence that any such device is not functioning properly, it shall be adjusted, repaired or replaced as necessary.

3.2.4 Valves

3.2.4.1 Blow-down Valves

Test the freedom of each blow-down valve and its connections by opening the valve and blowing down the UPV for a few seconds. Determine whether the valve is defective and whether there is evidence of restrictions in the valve or connected piping which may prevent proper blow-down of UPV.

3.2.4.2 Stop and Check Valves

While the UPV is operating, inspect the operating conditions of each stop and check valve where possible. Serious defects of externally controlled

stop valves may be detected by operating the valve when it is under pressure. Similarly, defects in check valves may be detected by listening to the operation of the valve or by observing any excessive vibration of the valve as it operates under pressure.

3.2.4.3 Pressure Reducing Valves

While there is pressure on the system, open and close the by-pass valve, as safety and operating conditions permit, and observe the fluctuation of the pressure gage pointer as an aid to determining possible defects in the operation of the pressure reducing valve. Forward this report to the Contracting Office for approval within 30 calendar days of the inspection.

3.3 REPAIRS

Prior to issuing a certificate, all deficiencies discovered during the inspections, the pressure test, and the operational tests, shall be corrected by the Contractor at no cost to the Government.

3.4 INSPECTION REPORTS AND CERTIFICATES

The following forms shall be used in the inspection and testing of UPV. Copies of each form are available from the Contracting Officer.

3.4.1 Data Record Sheet for UPV

This form shall be prepared, by the inspector, when performing the initial inspection on a UPV. Forward this report to the Contracting Officer for approval within 30 calendar days after the inspection.

3.4.2 Inspection Report for UPV

The inspector shall complete this form to record the condition of each UPV, the tests performed, and the issuance of the certificate. Forward this report to the Contracting Officer for approval within 30 calendar days of the inspection.

3.4.3 Inspection Certificate for UPV

A current and valid certificate, or commercial equivalent authorized by the Contracting Officer for contract inspection, shall be posted on or near the UPV under glass or other protective covering. Operation of the equipment without the certificate is not authorized. Issuance of this certificate shall be determined by the following criteria:

a. No Deficiencies: The inspector shall complete and sign after the test or inspection.

b. Deficiencies Not affecting Operating Safety: Certificate shall be withheld until deficiencies are corrected and UPV reinspected. The Contracting Officer shall be notified, in writing, of the specific deficiencies.

c. Pressure Reduction: Certificate shall be issued for the reduced working pressure. Notification, in writing, shall be made by the inspector to the Contracting Officer.

d. Unserviceable: Certificate will not be issued. The Contracting Officer shall be notified, in writing, of the deficiencies.

-- End of Section --